Visualization at the NCCS

Sean Ahern
Visualization Task Leader

2006 LCF Users' Meeting

Outline

- Visualization efforts and team
- Hardware resources
  - Visualization cluster
  - EVEREST display
- Visualization tools
- Data access issues and solutions
- Demo?

Many Coordinated Efforts

Production Visualization Support The team assists users with producing imagery of their large (and small) datasets using existing visualization applications. This includes support of visualization clusters for data processing.	*Custom Application Support* Addressing the individual needs of NCCS customers, the team writes custom applications and modules to augment the capabilities of standard production visualization systems.
Desktop Visualization Support As users perform data analysis on their desktop computers, the team assists them in discovering the most effective and interactive visualization methods for visual data understanding.	*Visualization Facility Support and Operation* Oak Ridge has high-resolution displays that users take advantage of for display of extremely large datasets. The visualization team deploys and supports these displays and their software.
Video Production For presentations and other purposes, users often request their data to be produced into videos with high production values. The visualization team provides these services.	*Visualization Research* Visualization is a rapidly changing field. The team explores new interaction modalities and data delivery mechanisms to provide the best visualization experience to our customers.

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Visualization Team

Sean Ahern
Jamison Daniel
Ross Toedte
Jinzhu Gao
George Ostrouchov
Some of Jeremy Meredith

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Hawk Visualization Cluster

- Dedicated visualization cluster
- 64 nodes
- Dual opterons, 1.6 MHz
- 128 gigs of memory
- Quadrics Elan3 interconnect
- NVIDIA 5900 and NVIDIA QuadroFX 3000G GPUs
- High-speed connection to 10 GigE infrastructure
- Lustre integration
- 14 nodes “dedicated” to EVEREST
- Firewall exception for hawk.ccs.ornl.gov, providing easy access to parallel vis resource

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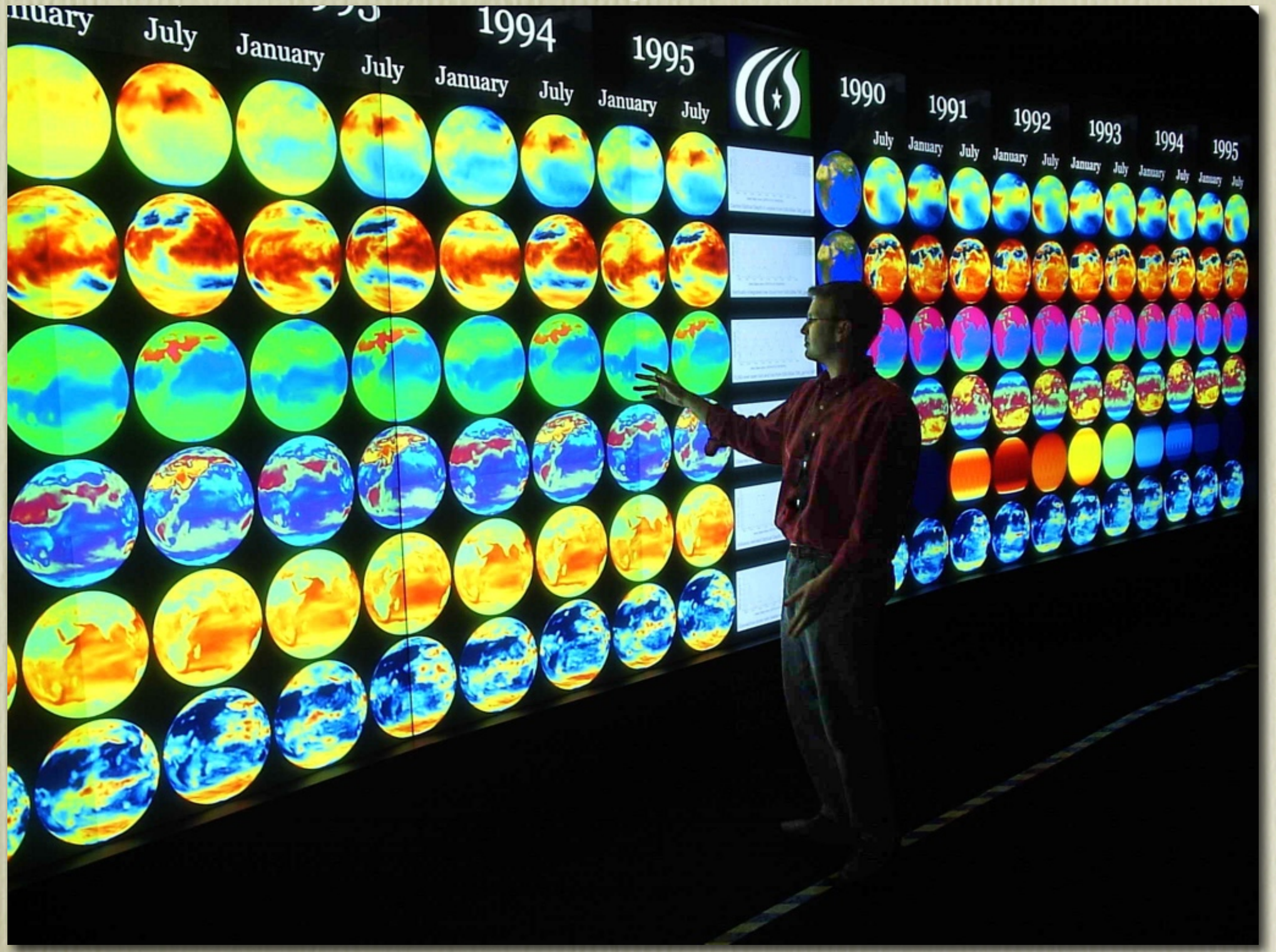
Display Devices

- EVEREST Powerwall
- 4x3 LCD Array
- Stereo-capable Immersadesk

EVEREST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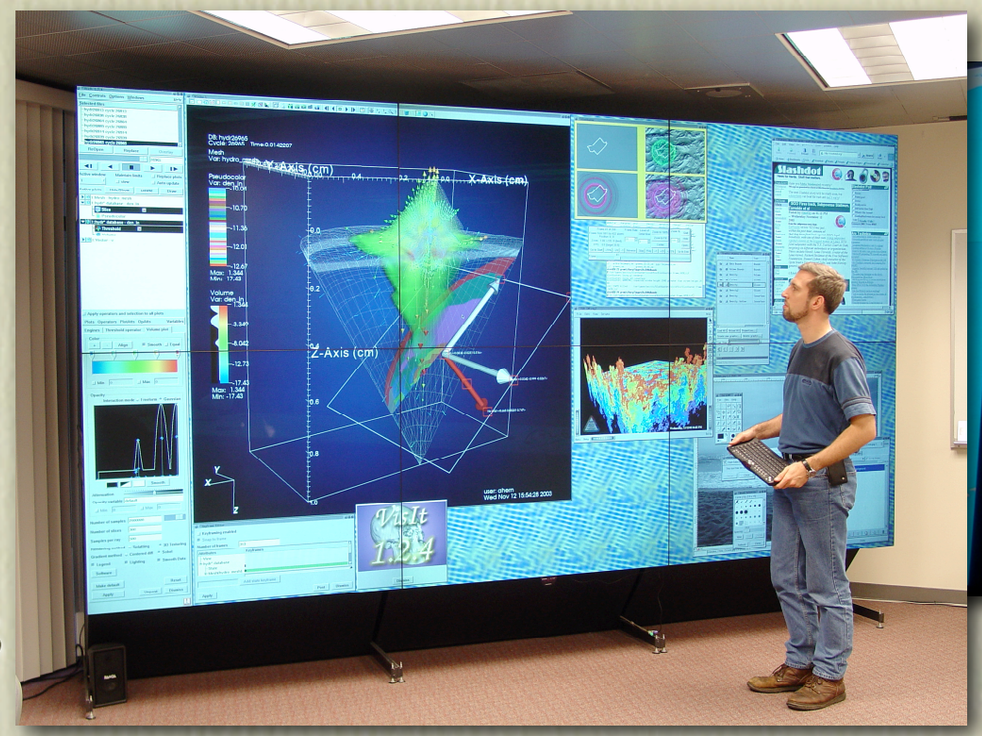
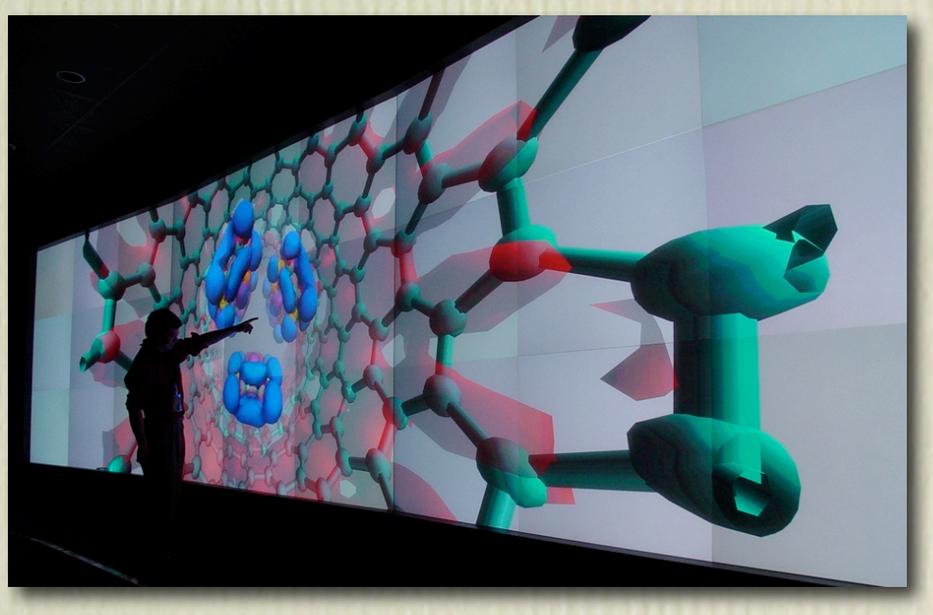
EVEREST Details

- Large format powerwall
- 30’ x 8’ in size
- 27 projectors
- 1280 x 1024: ~35 million pixels



- Enabling middleware:
  - DMX ⇒
    2D (X11) aggregation
  - Chromium ⇒
    3D (OpenGL) aggregation



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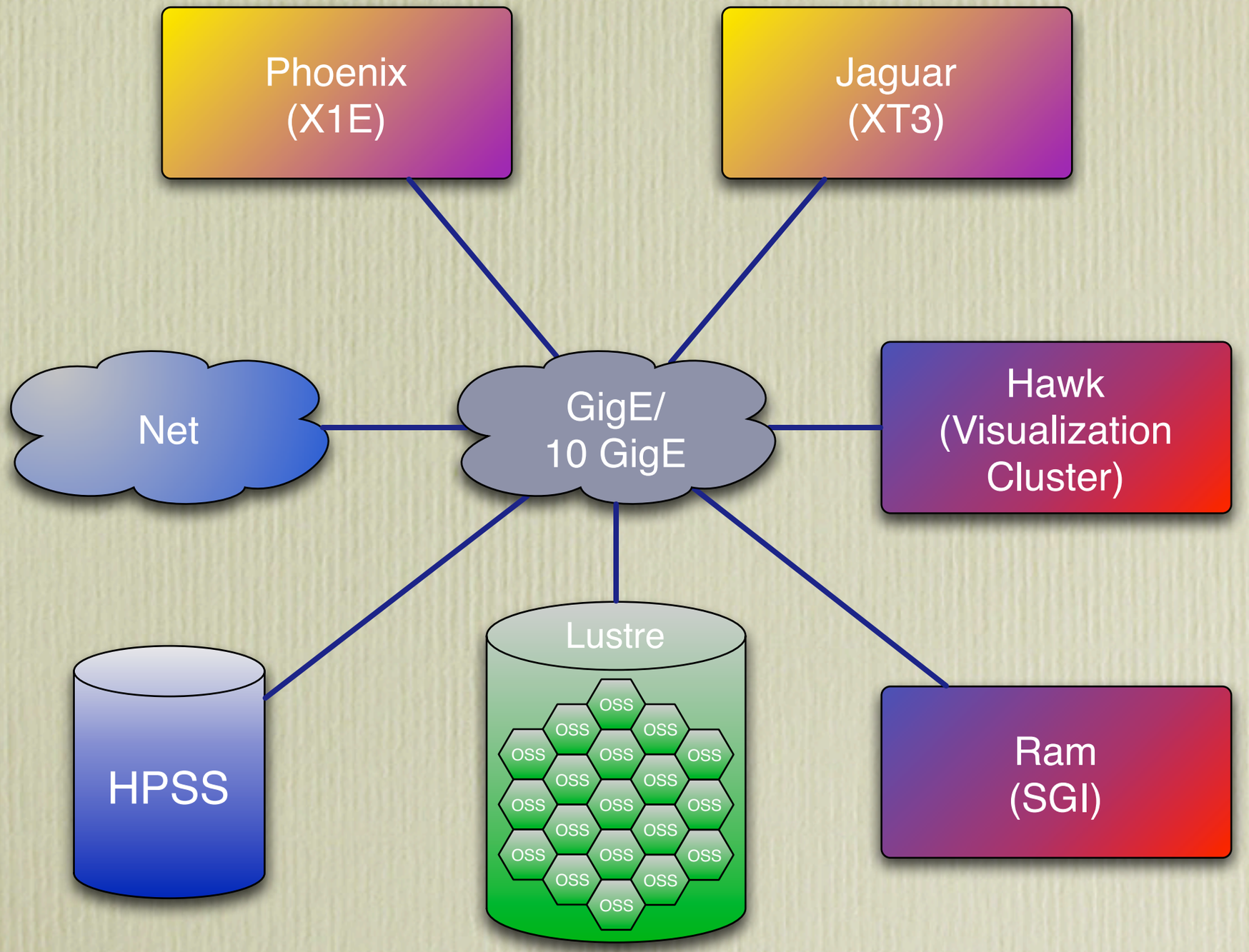
Network Infrastructure



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Deployed "Turnkey" tools

- VisIt
- EnSight
- Paraview
- VMD

What I mean by "turnkey" is:

- Rich set of features for visualization and analysis
- No programming is required to access main features
- It is flexible in its data input capabilities
- Scales to large data (maybe not VMD)

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Other Tools

- IDL
- AVS/Express
- VTK, ICE-T
- Maya
- POVRay, parallel POVRay
- Adobe Premiere, After Effects, etc.

Plenty more.... What do you want/need?

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"Locality" Issues

- Data and customer are often not located together.
- Data is getting much larger.
- Data movement becoming increasingly painful.

One solution: Decoupling of data processing and rendering/display

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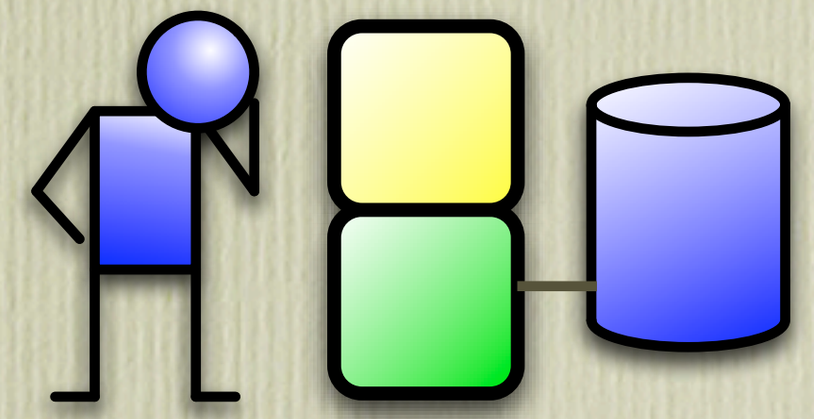
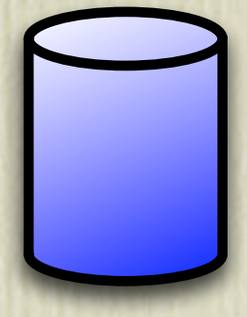
In the old days...



Remote Customers

Remote Site

NCCS



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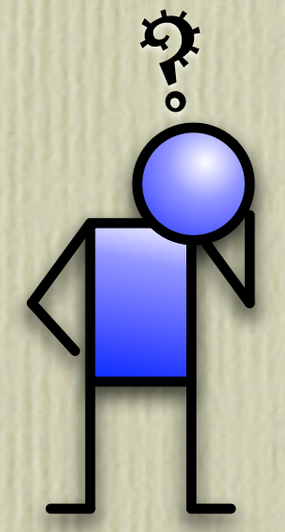
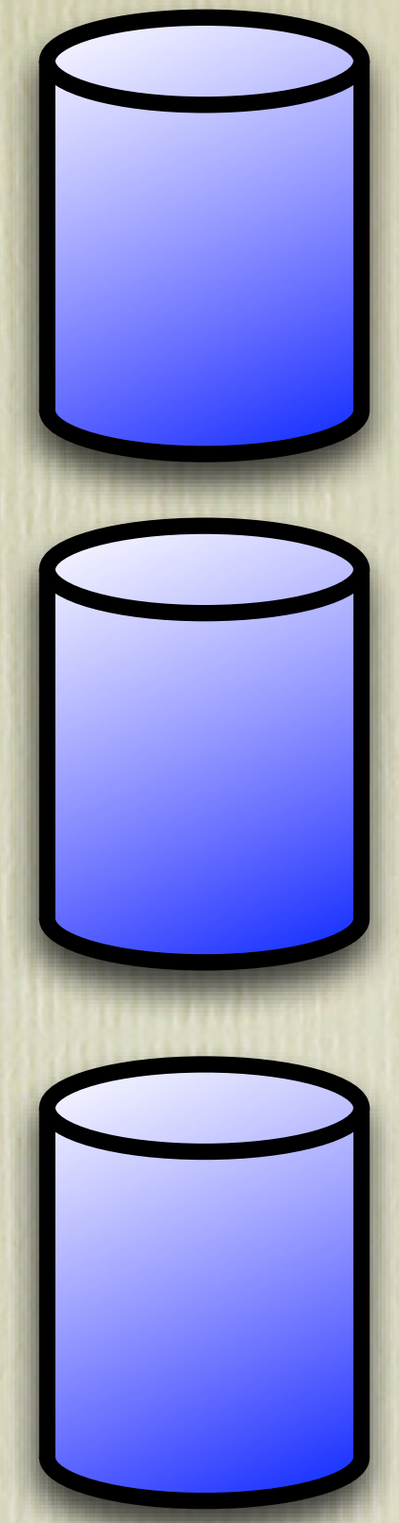
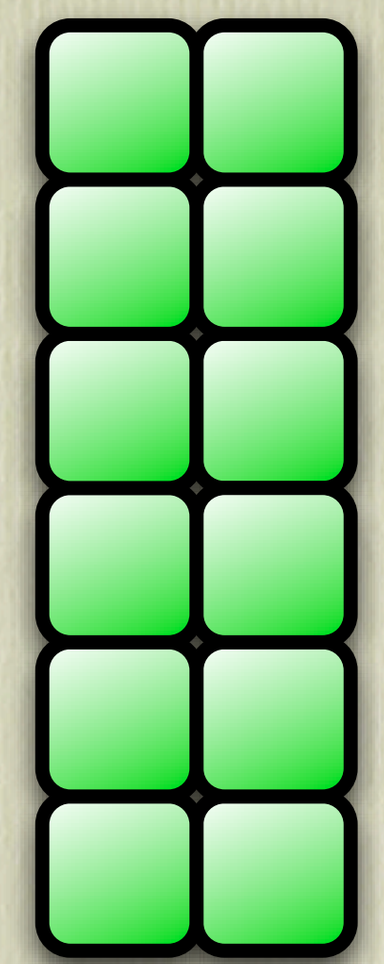
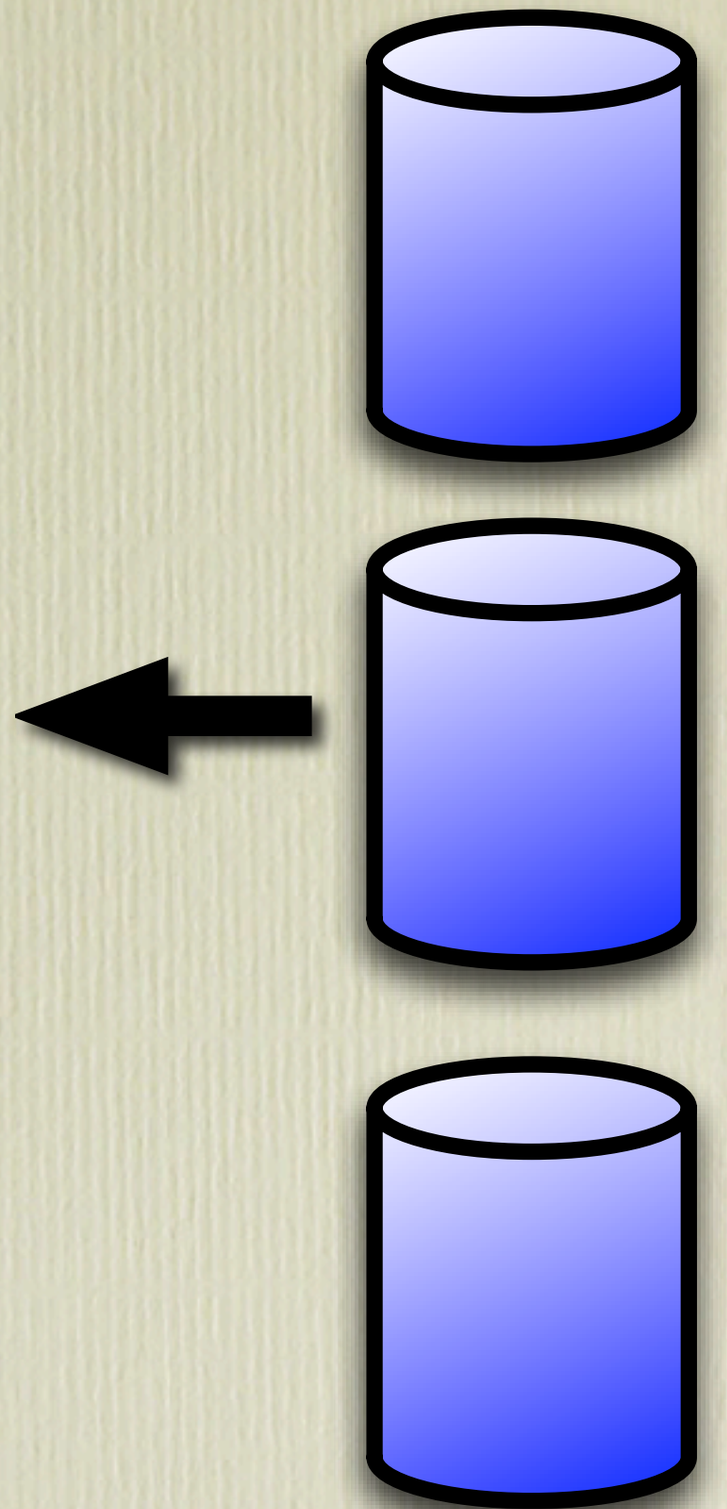
...with BIG data!



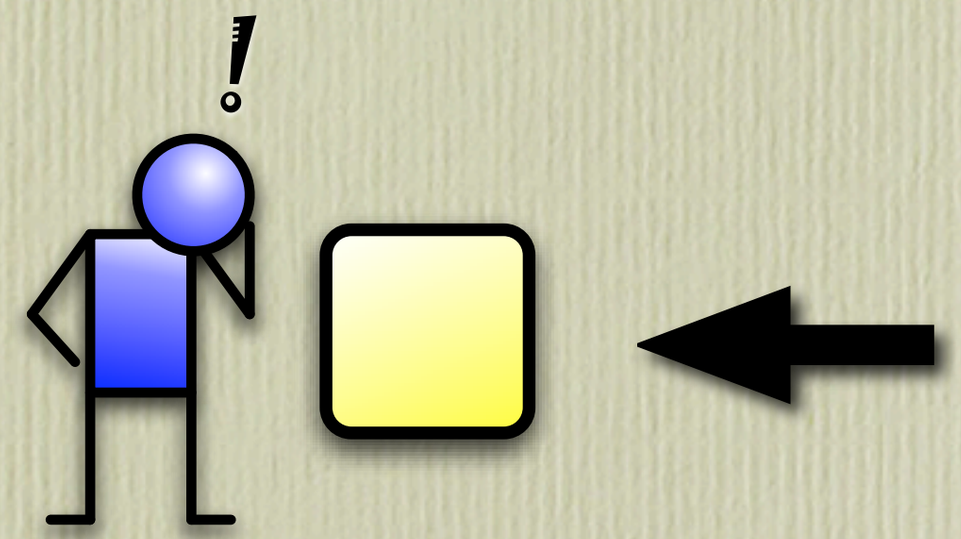


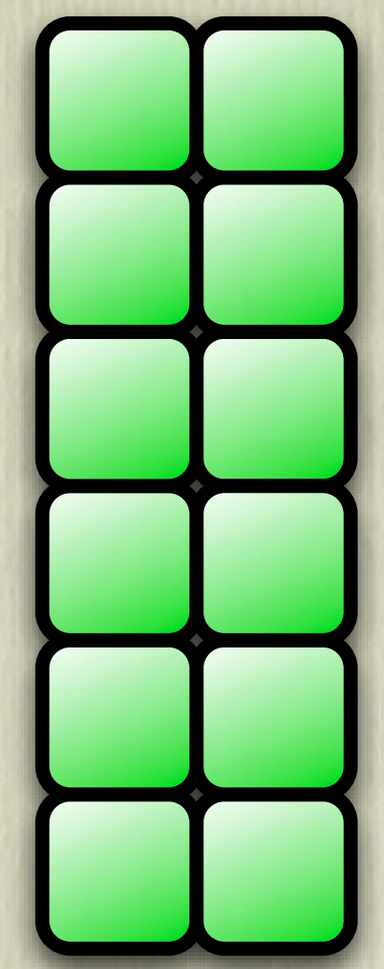
Separate data processing

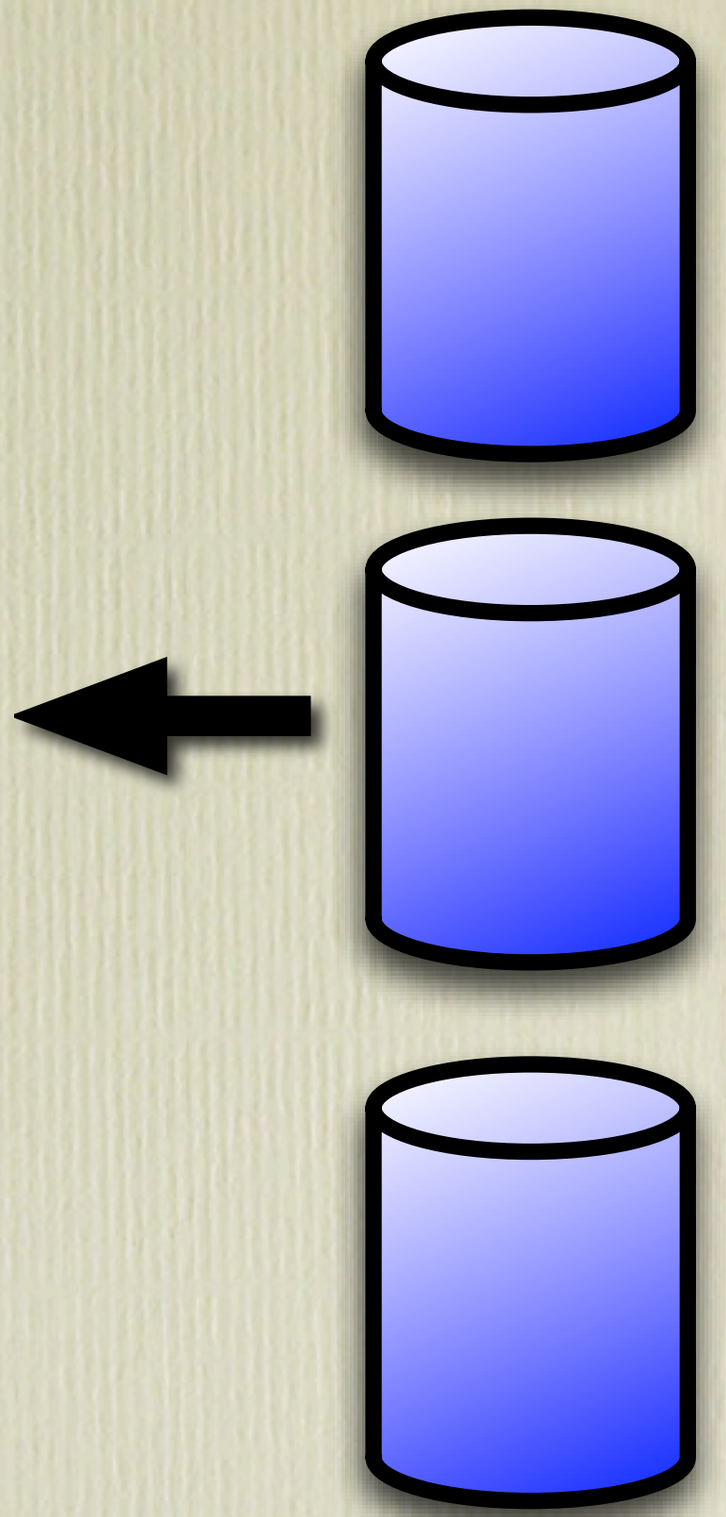




...from rendering







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Remote Visualization

- VisIt, Paraview, EnSight provide client/server access to large data visualization
  - Geometry across the network
  - Imagery across the network
- Issues/Concerns
  - Latency
  - Socket initiation issues

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Quick Preview of Tomorrow